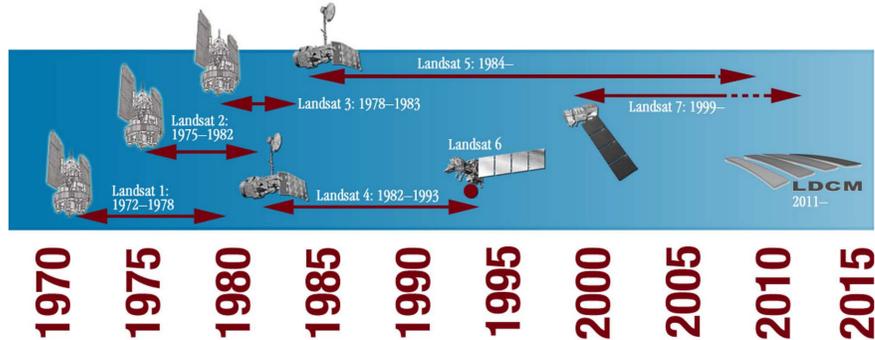




# Landsat Data Continuity Mission: Towards a 2011 Launch

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## Continuing 36 Years of Global Land Observation



## The Land Remote Sensing Policy Act of 1992

The Act (P.L. 102-555) directs Landsat Program Management to study options for a successor mission to Landsat 7 to:

1. "adequately serve the civilian, national security, commercial, and foreign policy interests of the United States"
2. "maintain data continuity with the Landsat system"
3. "incorporate system enhancements, including any such enhancements developed under the technology demonstration program under section 303, which may potentially yield a system that is less expensive to build and operate, and more responsive to data users"

The 1992 Act defines data continuity as:

"the continued acquisition and availability of unenhanced data which are, from the point of view of the user -

1. "sufficiently consistent (in terms of acquisition geometry, coverage characteristics, and spectral characteristics) with previous Landsat data to allow comparisons for global and regional change detection and characterization; and
2. compatible with such data and with methods used to receive and process such data."

## LDCM on Third and Final Implementation Strategy

1. 2001-2003: Government / Industry Partnership (aka Data Buy)
  - ☞ Formulation Phase: 2 private firms, Resource 21 and DigitalGlobe each awarded \$5M to conduct formulation phase studies leading to Dec., 2002 system PDR's
  - ☞ Implementation phase RFP released Jan., 2003; cancelled Sept., 2003
2. 2004-2005: NPOESS Integration
  - ☞ Aug. 13, 2004 memo from OSTP chief Marburger directs procurement of Landsat-type sensors for flights aboard NPOESS satellites
3. 2006-present: LDCM Free Flyer
  - ☞ Dec. 23, 2005 memo from OSTP chief Marburger redirects NASA to acquire free-flyer satellite for LDCM; directs USGS to operate satellite post-launch

## LDCM is a NASA/USGS Partnership



NASA leads:

- development of space segment (spacecraft + instrument)
- pre-launch calibration
- launch
- in-orbit check-out of space segment

USGS leads:

- development of ground segment
- satellite operations
- post-launch calibration
- data archiving
- data product generation and distribution



## Instrument – Operational Land Imager (OLI)



Ball Aerospace Technology Corporation selected July 2007:

- successful preliminary design review March 2008
- instrument delivery to spacecraft by October 2010

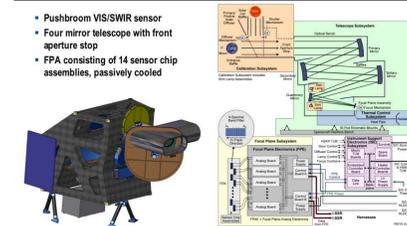
## OLI Spectral Band Requirements

#	L7 ETM+ Bands	LDCM OLI Band Requirements	#
		30 m, Coastal/Aerosol, 0.433-0.453 (2)	Band 1
Band 1	30 m, Blue, 0.450 - 0.515	30 m, Blue, 0.450-0.515	Band 2
Band 2	30 m, Green, 0.525 - 0.605	30 m, Green, 0.525-0.600	Band 3
Band 3	30 m, Red, 0.630 - 0.690	30 m, Red, 0.630-0.680	Band 4
Band 4	30 m, Near-IR, 0.775 - 0.900	30 m, Near-IR, 0.845-0.885	Band 5
Band 5	30 m, SWIR-1, 1.550 - 1.750	30 m, SWIR-1, 1.560-1.660	Band 6
Band 6	60 m, LWIR, 10.00 - 12.50	N/A (3)	
Band 7	30 m, SWIR-2, 2.090 - 2.350	30 m, SWIR-2, 2.100-2.300	Band 7
Band 8	15 m, Pan, 0.520 - 0.900	15 m, Pan, 0.500-0.680	Band 8
		30 m, Cirrus, 1.360-1.390 (1)	Band 9

**Explanation of Differences**  
 1. Cirrus Band added in 2001 to detect cirrus contamination in other channels  
 2. Coastal Band added in 2001 at request of ocean color investigators requiring higher resolution of coastal waters relative to MODIS and SeaWiFS  
 3. LWIR removed from LDCM in 2002 during data buy attempt primarily due to lack of commercial market for thermal data  
 4. Bandwidth refinements made in all bands to avoid atmospheric absorption features (Enabled by higher SNR which is, in turn, enabled by push-broom instrument architecture)

## OLI Design

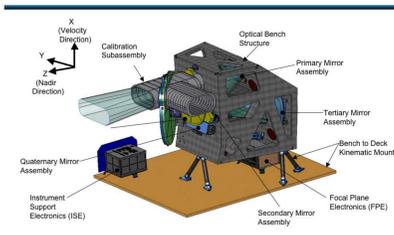
### Baseline Design and Descriptive Block Diagram



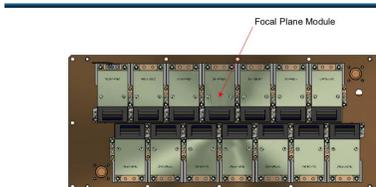
### Calibration Subassembly Overview



### OLI Instrument Overview

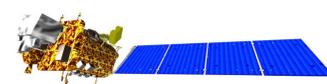


### Focal Plane Consists of 14 Modules



## Spacecraft

General Dynamics Advanced Information Systems, Inc. selected to build spacecraft April 22, 2008



## Launch Vehicle

Lockheed Martin Commercial Launch Services selected on Oct. 3, 2007 to launch LDCM on an Atlas V



**Target Launch Date July 2011**

## New Data Policy

On April 21, 2008 the USGS released a USGS Technical Announcement stating:  
 ☞ "By February 2009, any Landsat archive scene selected by a user will be processed, at no charge, automatically to a standard product recipe and staged for electronic retrieval."  
 • Orthorectified  
 • Universal Transverse Mercator (UTM) Projection

### Implementation schedule:

Landsat 7 – all new global acquisitions July 2008  
 Landsat 7 – all data September 2008  
 Landsat 5 – all TM data December 2008  
 Landsat 4 – all TM data January 2009  
 Landsat 1-5 – all MSS data January 2009

In January 2008, Barbara Ryan, USGS Assoc. Director for Geography, and Michael Freilich, NASA Earth Science Division Director, signed a new "Landsat Data Distribution Policy"

☞ "... the USGS provides selected satellite data products for retrieval via the Internet at no charge to the users."

USGS EROS had historically distributed Landsat data products to the general public on a non-discriminatory basis at the "cost of fulfilling a user request (COFUR)."

☞ \$600 per Landsat 7 ETM+ scene

## Landsat 5 and Landsat 7 Status

### Landsat 7 - 1999 Launch - 4 years past design life

1. Spacecraft
  - ☞ Gyro 3 Failure (Shut down May 5, 2004)
  - ☞ Working additional improvements for software gyro
  - ☞ Other Spacecraft Issues (non-critical)
  - ☞ Solid State Recorder – 4 memory boards
  - ☞ Electrical Power Subsystem – shunt #14 and shunt #6
  - ☞ Fuel Line Thermostat
2. ETM+
  - ☞ Scan Line Corrector Failure (May 31, 2003)
  - ☞ Bumper Mode Operations (April 1, 2007)



### Landsat 5 - 1984 Launch - 21 years past design life!!!!

1. Spacecraft
  - ☞ Battery 2 Anomaly (On-going) – Oct 2007
    - Image collection restored in Feb. 2008
  - ☞ Star Tracker Issue – June 2007
  - ☞ Solar Array Drive
    - Fixed array operations – Aug 2006
2. ETM
  - ☞ Functioning normally in bumper-mode



## National Asset Declaration

The President's Science Advisor, Dr. John Marburger, III, stated in an August 13, 2004 memorandum with subject line "Landsat Data Continuity Strategy"

"Landsat is a national asset, and its data have made – and continue to make – important contributions to U.S. economic, environmental, and national security interests. Specifically, Landsat images are the principal source of global, medium resolution, spectral data used by Federal, state, and local government agencies, academia, and the private sector in land use/land cover change research, economic forecasting, disaster recovery and relief, and the scientific study of human impacts on the global environment. Additionally, Landsat data are utilized by over 70 countries and are an important part of a global, integrated Earth observation system."

## Further Information

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